Amendments to the Claims

1-16. (canceled)

17. (currently amended) A method, in a tone generation module, for assigning bits in a plurality of frames to a plurality of tones in a multitone transmission, wherein the bits in each frame are assigned to [[a]] the plurality of tones, comprising:

(a) receiving, in an assignment module, a first unique tone order mapping sequence in a set of unique tone order mapping sequences, wherein the first unique tone order mapping sequence defines a first order of the plurality of tones;

(b) assigning bits in a first frame to the plurality of tones according to the first unique tone order mapping sequence;

(c) receiving, in the assignment module, a second unique tone order mapping sequence in the set of unique tone order mapping sequences, wherein the second unique tone order mapping sequence defines a second order of the plurality of tones;

(d) assigning bits in a second frame to the plurality of tones according to the second unique tone order mapping sequence; and

(e) repeating steps (c) and (d) for each unique tone order mapping sequence in the set of unique tone order mapping sequences,

wherein the set of unique tone order mapping sequences includes one mapping sequence for each possible permutation of tone ordering, wherein the number of permutations is based on the number of tones being used for the transmission.

~~whereby a frame bit position is mapped to a different tone in the plurality of tones in a plurality of successive frame assignments~~.

18. (previously presented) The method of claim 17, further comprising:

(d) repeating steps (a) through (e) for successive frame assignments after a complete assignment cycle using each unique tone order mapping sequence in the set of unique tone order mapping sequences has been completed.

19. (currently amended) The method of claim 17, wherein bits in each frame are assigned to n discrete tones, where n is an integer, and wherein assigning bits in a jth frame comprises:

allocating an ith tone to transmit b(i) number of bits, where b(i) is an independent positive integer for each of the n tones; and

wherein the assigning step for each frame includes:

assigning, in the jth frame, each consecutive $b(n_{jk})$ bits starting from the first bit of the frame to the n_{jk}th tone in sequential order as k increases from 1 to n, where [n_{j1}, n_{j2}, n_{j3}, ... n_{jn}] is a tone order sequence of the first n positive integers [1, 2, 3, ... n], wherein j is a frame within a sequence of frames.

20. (currently amended) The method of claim 17, further comprising:

for each of the discrete tones, generating for each frame an amplitude phase keyed constellation point representing the bits allocated to the tone; and

using an inverse discrete Fourier transform to generate a transmitted output signal from the amplitude phase keyed constellation points.

21. (previously presented) The method of claim 20, wherein the amplitude phase keyed constellation points are quadrature amplitude modulation constellation points.

22. (previously presented) The method of claim 1, wherein the bits in each frame are trellis encoded.

23. (currently amended) A discrete multitone transmitter for transmitting a stream of bits making up a plurality of frames, wherein the bits in each frame are assigned to a plurality of tones, comprising:

a tone generator, wherein the tone generator includes:

means for defining a set of unique tone order mapping sequences, wherein the set of unique tone order mapping sequences includes one mapping sequence for each possible permutation of tone ordering, wherein the number of permutations is based on the number of tones being used for the transmission ~~defines a plurality of possible unique order sequences for the plurality of tones~~,

means for assigning bits in one of the plurality of frames to the plurality of tones according to a unique tone order mapping sequence in the set of unique tone order mapping sequences, wherein the means for assignment uses each of the unique tone order mapping sequences before repeating any of the unique tone order mapping sequences in the set of unique tone order mapping sequences, and

a constellation generator configured to generate a constellation point for each of the plurality of tones representing the assigned bits; and

an inverse Fourier transform module configured to generate an output signal including the plurality of discrete tones from the constellation points.

24. (previously presented) The discrete multitone transmitter according to claim 23, wherein bits in each frame are assigned to n discrete tones, where n is an integer,

wherein the tone generator includes a bit allocation table allocating b(i) bits to the ith tone, where b(i) is an independent positive integer for each of the n tones; and

wherein the assignment means includes means for assigning in the jth frame the first $b(n_{j1})$ bits of the bit stream to the n_{j1}th tone, and each subsequent $b(n_{jk})$ bits are assigned to the n_{jk}th tone in sequential order as k increases from 1 to n, where [n_{j1}, n_{j2}, n_{j3}, ... n_{jn}] is a tone order sequence of the first n positive integers [1, 2, 3, ... n], wherein j is a frame within a sequence of frames.

25. (currently amended) A method, in a receiver, for decoding a discrete multitone (DMT) transmission into a plurality of output data frames, comprising:

(a) receiving a sequence of symbols representing constellation points, wherein each output data frame is associated with a plurality of tones and each tone in the plurality of tones includes a constellation point;

(b) for each tone associated with a first output data frame, generating, in a decoder, a bit sequence representing the constellation point for the tone;

(c) receiving, in the decoder, a first unique tone order mapping sequence in a set of unique tone order mapping sequences, wherein the first unique tone order mapping sequence defines a first order for assigning the tone bit sequences to the first output data frame;

(d) assigning the received bit sequences for each tone associated with the first output data frame sequentially to the first output data frame according to the first unique tone order mapping sequence;

(e) for each tone associated with a second output data frame, generating, in a decoder, a bit sequence representing the constellation point for the tone;

(f) receiving, in the decoder, a second unique tone order mapping sequence in the set of unique tone order mapping sequences, wherein the second unique tone order mapping sequence defines a second order for the tone bit sequences in the second output data frame;

(g) assigning the received bit sequences for each tone associated with the second output data frame sequentially to the second data frame according to the second unique tone order mapping sequence; and

(h) repeating steps (e)-(g) for each unique tone order mapping sequence in the set of unique tone order mapping sequences ,

wherein the set of unique tone order mapping sequences includes one mapping sequence for each possible permutation of tone ordering, wherein the number of permutations is based on the number of tones being used for the transmission.

26. (currently amended) The method of claim 25, wherein n discrete tones are associated with each output data frame, where n is an integer, an ith tone being allocated b(i) number of bits, where b(i) is an independent positive integer for each of the n tones, further comprising:

for each output data frame (j):

obtaining ~~for each frame (j)~~ the unique tone order mapping sequence [n_{j1}, n_{j2}, n_{j3}, ... n_{jn}] of the first n positive integers [1, 2, 3, ... n], and

generating an output data frame by taking the first $b(n_{jk})$ bits of the bit sequence decoded for the n_{j1}th tone, and the subsequent bits in order from the decoded n_{j2}th tone, the n_{j3}th tone until the last bits are taken from the bit sequence decoded for the n_{jn}th tone, wherein j is an output data frame within a sequence of output data frames.

27. (previously presented) The method of claim 25, further comprising:

receiving, from a transmitter, the set of unique tone order mapping sequences to be used to decode the received DMT transmission.

28. (previously presented) The method of claim 25, further comprising:

(i) repeating steps (a) through (h) for successive frame assignments after a complete assignment cycle using each unique tone order mapping sequence in the set of unique tone order mapping sequences has been completed.

29. (currently amended) A discrete multitone (DMT) modem for receiving a DMT transmission and decoding the DMT transmission into a plurality of output data frames, comprising:

means for receiving a sequence of symbols representing constellation points, wherein each output data frame is associated with a plurality of tones and each tone in the plurality of tones includes a constellation point; and

a tone decoder, wherein the tone decoder includes:

means for generating a bit sequence representing a constellation point for each tone associated with an output data frame,

means for receiving a set of unique tone order mapping sequences, wherein each unique tone order mapping sequence defines an order for assigning bit sequences to an output data frame and wherein the set of unique tone order mapping sequences includes one mapping sequence for each possible permutation of tone ordering, wherein the number of permutations is based on the number of tones being used for the transmission, and

means for assigning bit sequences for each tone associated with an output data frame to the output data frame according to a unique tone order mapping sequence in the set of unique tone order mapping sequences, wherein the assignment means uses each of the unique tone order mapping sequences before repeating any of the unique tone order mapping sequences in the set of unique tone order mapping sequences.

30. (currently amended) A method, in a tone generation module, for assigning bits in a plurality of frames to tones in a multitone transmission, wherein the bits in each frame are assigned to a plurality of tones, comprising:

generating, in a scrambling module, a set of unique tone order mapping sequences, wherein each unique tone order mapping sequence defines an order for assigning bits to the plurality of tones and wherein the set of unique tone order mapping sequences includes one mapping sequence for each possible permutation of tone ordering, wherein the number of permutations is based on the number of tones being used for the transmission; and

for a first plurality of frames, assigning bits in each frame to the plurality of tones according to one tone order mapping sequence in the set of tone order mapping

sequences, wherein each unique tone order mapping sequence is used once during the assignment cycle for the first plurality of frames [[,]]

~~whereby a frame bit position is mapped to a different tone in the plurality of tones in the set of unique tone order mapping sequences~~.

31. (previously presented) The method of claim 30, further comprising:

for a second plurality of frames, assigning bits in each frame to the plurality of tones according to one tone order mapping sequence in the set of tone order mapping sequences, wherein each unique tone order mapping sequence is used once during the assignment cycle for the second plurality of frames.